

WHAT IS CLAIMED IS:

- 1 1. A method for forming self-pinned abutted junction heads, comprising:
2 forming a free layer;
3 forming first hard bias layers abutting the free layer; and
4 forming second hard bias layers over the first hard bias layers discontinuous
5 from the free layer, the second hard bias layers being anti-parallel to the first hard bias
6 layers, the first and second hard bias layers providing a net longitudinal bias on the free
7 layer.
- 1 2. The method of claim 1, wherein the forming the first and second hard bias
2 layers further comprises forming the first hard bias layers with a thickness substantially
3 equal to a thickness of the second hard bias layers.
- 1 3. The method of claim 1, wherein the forming the first and second hard bias
2 layers further comprises forming the first hard bias layers with a thickness greater than a
3 thickness of the second hard bias layers.
- 1 4. The method of claim 1 further comprising forming an interlayer separating
2 the first and second hard bias layers.

1 5. The method of claim 1 further comprising forming a self-pinned layer, the
2 self-pinned layer having a first end, a second end and central portion, wherein the central
3 portion is aligned with the free layer and the first hard bias layers are formed over the
4 first and second ends of the self-pinned layer.

1 6. The method of claim 5 further comprising forming a spacer layer over the
2 self-pinned layer and forming a first and second seed layer between the first and second
3 hard bias layer and the spacer layer.

1 7. The method of claim 6 further comprising forming amorphous layers
2 between the spacer and the first and second seed layers, the amorphous layer stopping
3 epitaxial growth between the self-pinned layer and the first and second hard bias layers.

1 8. The method of claim 5 further comprising forming amorphous layers
2 between the self-pinned layer and the first and second hard bias layers for stopping
3 epitaxial growth between the self-pinned layer and the first and second hard bias layers.

1 9. The method of claim 1 further comprising forming first and second leads
2 over the first and second hard bias layers.

1 10. The method of claim 1, wherein the forming the free layer further
2 comprises forming the free layer with a length selected for a desired track width.

1 11. A self-pinned abutted junction magnetic read sensor, comprising:
2 a free layer for sensing magnetic fluxuations;
3 first hard bias layers abutting the free layer; and
4 second hard bias layers, formed over the first hard bias layers discontinuous
5 from the free layer, the second hard bias layers being anti-parallel to the first hard bias
6 layers, the first and second hard bias layers providing a net longitudinal bias on the free
7 layer.

1 12. The sensor of claim 11, wherein the first hard bias layers is formed with a
2 thickness substantially equal to a thickness of the second hard bias layers.

1 13. The sensor of claim 11, wherein the first hard bias layers is formed with a
2 thickness greater than a thickness of the second hard bias layers.

1 14. The sensor of claim 11 further comprising interlayers disposed between
2 the first and second hard bias layers.

1 15. The sensor of claim 11 further comprising a self-pinned layer, the self-
2 pinned layer having a first end, a second end and central portion, wherein the central
3 portion is aligned with the free layer and the first hard bias layers are formed over the
4 first and second ends of the self-pinned layer.

1 16. The sensor of claim 15 further comprising a spacer layer formed over the
2 self-pinned layer and a first and second seed layer formed between the first and second
3 hard bias layer and the spacer layer.

1 17. The sensor of claim 16 further comprising amorphous layers formed
2 between the spacer and the first and second seed layers, the amorphous layer stopping
3 epitaxial growth between the self-pinned layer and the first and second hard bias layers.

1 18. The sensor of claim 15 further comprising amorphous layers formed
2 between the self-pinned layer and the first and second hard bias layers for stopping
3 epitaxial growth between the self-pinned layer and the first and second hard bias layers.

1 19. The sensor of claim 11 further comprising first and second leads formed
2 over the first and second hard bias layers.

1 20. The sensor of claim 11, wherein the free layer further comprises a length
2 selected for a desired track width.

1 21. A magnetic storage system, comprising:
2 a moveable magnetic storage medium for storing data thereon;
3 an actuator positionable relative to the moveable magnetic storage medium; and
4 a magnetoresistive sensor, coupled to the actuator, for reading data from the
5 magnetic recording medium when position to a desired location by the actuator, wherein
6 the magnetoresistive sensor further comprises:
7 a free layer for sensing magnetic fluxuations;
8 first hard bias layers abutting the free layer; and
9 second hard bias layers, formed over the first hard bias layers
10 discontiguous from the free layer, the second hard bias layers being anti-parallel
11 to the first hard bias layers, the first and second hard bias layers providing a net
12 longitudinal bias on the free layer.

1 22. The magnetic storage system of claim 21, wherein the first hard bias
2 layers is formed with a thickness substantially equal to a thickness of the second hard
3 bias layers.

1 23. The magnetic storage system of claim 21, wherein the first hard bias
2 layers is formed with a thickness greater than a thickness of the second hard bias layers.

1 24. The magnetic storage system of claim 21 further comprising interlayers
2 disposed between the first and second hard bias layers.

1 25. The magnetic storage system of claim 21 further comprising a self-pinned
2 layer, the self-pinned layer having a first end, a second end and central portion, wherein
3 the central portion is aligned with the free layer and the first hard bias layers are formed
4 over the first and second ends of the self-pinned layer.

1 26. The magnetic storage system of claim 25 further comprising a spacer layer
2 formed over the self-pinned layer and a first and second seed layer formed between the
3 first and second hard bias layer and the spacer layer.

1 27. The magnetic storage system of claim 26 further comprising amorphous
2 layers formed between the spacer and the first and second seed layers, the amorphous
3 layer stopping epitaxial growth between the self-pinned layer and the first and second
4 hard bias layers.

1 28. The magnetic storage system of claim 25 further comprising amorphous
2 layers formed between the self-pinned layer and the first and second hard bias layers for
3 stopping epitaxial growth between the self-pinned layer and the first and second hard bias
4 layers.

1 29. The magnetic storage system of claim 21 further comprising first and
2 second leads formed over the first and second hard bias layers.

1 30. The magnetic storage system of claim 21, wherein the free layer further
2 comprises a length selected for a desired track width.

1 31. A self-pinned abutted junction magnetic read sensor, comprising:
2 first means for sensing magnetic fluxuations;
3 first bias means abutting the first means on opposite sides of the first means; and
4 second bias means, formed over the first bias means discontinuous from the first
5 means for sensing magnetic fluxuations, the second bias means being anti-parallel to the
6 first bias means, the first and second bias means providing a net longitudinal bias on the
7 first means for sensing magnetic fluxuations.

1 32. A magnetic storage system, comprising:
2 a moveable magnetic storage means for storing data thereon;
3 an actuator positionable relative to the moveable magnetic storage medium; and
4 a magnetoresistive sensor, coupled to the actuator, for reading data from the
5 magnetic recording medium when position to a desired location by the actuator, wherein
6 the magnetoresistive sensor further comprises:
7 first means for sensing magnetic fluxuations;
8 first bias means abutting the first means on opposite sides of the first
9 means; and
10 second bias means, formed over the first bias means discontinuous from
11 the first means for sensing magnetic fluxuations, the second bias means being anti-
12 parallel to the first bias means, the first and second bias means providing a net
13 longitudinal bias on the first means for sensing magnetic fluxuations.